



**UNIVERSITI PUTRA MALAYSIA**

**FOOD AVAILABILITY AND STOMACH CONTENT OF FISH  
POPULATIONS IN SEMENYIH RESERVOIR, MALAYSIA**

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**FOOD AVAILABILITY AND STOMACH CONTENT OF FISH POPULATIONS IN  
SEMENYIH RESERVOIR, MALAYSIA**

By

**EDUARDO D. PERALTA**

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in  
Fulfillment of the Requirements for the Degree of Master of Science

December 2004



## **DEDICATION**

This piece of work is dedicated to my wife, Hazel Monica Matias- Peralta, my son, Zeckiel Matias Peralta, my family, for their support, assistance and confidence in me and for the memory of my late father.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

## FOOD AVAILABILITY AND STOMACH CONTENT OF FISH POPULATIONS IN SEMENYIH RESERVOIR, MALAYSIA

By

EDUARDO DIZON PERALTA

December 2003

Chairman : Mustafa Kamal Abdul Satar, Ph.D.

Faculty : Agriculture

This study was done to evaluate the food availability and stomach content of fish populations in Semenyih Reservoir, Malaysia. Samples were collected at monthly intervals from November 1998 to October 1999. Fish specimens were collected from twelve stations at the shallow littoral zone of the reservoir using various sizes of gill nets for the investigation of fish species inhabiting the reservoir and for the examination of the gut content. A total of 1,469 fish were collected from the Reservoir throughout the study. Seven species belonging to seven different families were identified. Fish community consisted of *Mystacoleocus marginatus* C&V (sia), *Hampala macrolepidota* van Hasselt (sebarau) *Cyclocheilichthys apogon* C&V (merah mata), *Osteochilus hasselti* C&V (terbul), *Oreochromis mossambicus* Peters (tilapia), *Oxyleotris marmoratus* Bleeker (Ketutu), and *Mystus nemurus* C&V (baung). *Mystacoleocus marginatus* was the most dominant species, comprising 64.6% of the total number of fish sampled, followed by *H. macrolepidota* (24.8%), *C. apogon* (4.2%), *O. hasseltii* (2.6%), *O. mossambicus* (1.4%), *O. marmoratus* (1.3%), and *M. nemurus* (1.1%). Composition and frequency of occurrence of food items

have been studied. Phytoplankton, insects and zooplankton were found to be the main food items consumed of different fish species in the reservoir. While the least food items were mollusks, juvenile fish and crustaceans. *Mystacoleocus marginatus*, *Cyclochelichthys apogon* and *Oreochromis mossambicus* were largely omnivore at the time they were analyzed. While *Hampala macrolepidota*, *Osteochilus hasseltii*, *Oxyleotris marmoratus* and *Mystus nemurus* were highly carnivorous at the time they were analyzed. The phytoplankton community was composed of six different groups, (chlorophytes, cyanophytes, bacillariophytes, crysophytes, euglenoids and dinoflagellates) with a mean total density of  $20.41 \times 10^4$  cells  $\text{ml}^{-1}$ . Among the six groups, chlorophytes was the most dominant with a mean density of 64,806.40 cells  $\text{ml}^{-1}$ , followed by bacillariophytes (51,836.28 cells  $\text{ml}^{-1}$ ); cyanophytes (48,916.48 cells  $\text{ml}^{-1}$ ); dinoflagellates (24,943.25 cells  $\text{ml}^{-1}$ ); crysophytes (11,387.68 cells  $\text{ml}^{-1}$ ) and euglenoids (2,189.59 cells  $\text{ml}^{-1}$ ). On the other hand, the zooplankton community consisted of three groups, namely, copepods, cladocerans and rotifers. Zooplankton was dominated by copepods with a total density of 2,701.27 organisms  $\text{l}^{-1}$ , followed by rotifers (2,297.40 organisms  $\text{l}^{-1}$ ) and cladocerans (7,16.47 organisms  $\text{l}^{-1}$ ). The macrobenthos of Semenyih Reservoir was composed of mollusks, annelids and chironomids, with a mean total density of 13,658.33 organisms/ $\text{m}^2$ . Among these groups, mollusks were the most dominant with a mean density of 11,525.17 organisms/ $\text{m}^2$ ; followed by chironomids (1,599.88 organisms/ $\text{m}^2$ ) and annelids (533.29 organisms/ $\text{m}^2$ ). Physico-chemical and biological parameters of Semenyih Reservoir were also studied. Temperature, dissolved oxygen, secchi disk visibility and pH values range from 27.55-30.00 °C, 6.63-7.33 mg  $\text{l}^{-1}$ ; 50.60 - 99.80 cm; and 6.96 – 7.84, respectively. Nitrate-nitrogen, phosphate-phosphorous, silica and ammonia-nitrogen ranges from 0.09 mg  $\text{l}^{-1}$  to 0.15 mg  $\text{l}^{-1}$ , 2.71-5.26 mg  $\text{l}^{-1}$ , 0.2-0.3 mg  $\text{l}^{-1}$  and 0.06 - 0.24 mg  $\text{l}^{-1}$  respectively. One concluding sentence about the

reservoir based on the water quality, plankton and macrobenthos composition, and fish population, Semenyih Reservoir was a mesotrophic body of water.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**KAJIAN TERHADAP KETERDAPATAN MAKANAN DAN KANDUNGAN PERUT  
BAGI POPULASI IKAN DI EMPANGAN SEMENYIH, MALAYSIA**

Oleh

**EDUARDO D. PERALTA**

**Disember 2003**

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**Fakulti: Pertanian**

Kajian ini dilakukan untuk mengetahui keterdapatan makanan dan kandungan perut bagi populasi ikan di Empangan Semenyih, Malaysia. Pemungutan sampel dilakukan setiap bulan dari November 1998 sehingga Oktober 1999. Spesimen ikan telah dikumpul dari dua belas stesen di zon littoral cetek empangan tersebut menggunakan jaring insang pelbagai saiz untuk kerja pemeriksaan kandungan perut. Keputusan menunjukkan terdapat tujuh spesies dalam komuniti ikan di Empangan Semenyih. *M. marginatus* merupakan spesies dominan mewakili 64.6% dari jumlah keseluruhan ikan yang dikumpul. Spesis-spesis ikan yang selebihnya adalah *H. macrolepitoda* (24.8%), *C. Apogon* (4.2%), *O. Hasseltii* (2.6%), *O. Mossambicus* (1.4%), *O. Marmoratus* (1.3%) dan *M. nemurus* (1.1%). Komposisi serta frekuensi makanan telah dikaji. Fitoplankton, serangga serta zooplankton telah dikenalpasti menjadi makanan utama pelbagai spesis ikan di empangan tersebut, sementara moluska, ikan juvenil serta krustasia merupakan jenis makanan yang paling sedikit ditemui. Ketika analisis dilakukan, didapati kebanyakan spesis seperti *Mystacoleocus marginatus*, *Cyclochelichthys apogon* dan *Oreochromis mossambicus* merupakan jenis omnivor. Sementara spesis seperti *Hampala macrolepidota*, *Osteochilus hasseltii*, *Oxyleotris marmoratus* dan *Mystus nemurus*



dimana kebanyakannya merupakan organisma karnivor. Fitoplankton dari empangan ini terdiri dari enam kumpulan, kumpulan-kumpulan tersebut mempunyai komposisi purata menyeluruh pada  $20.56 \times 10^4$  sel  $\text{ml}^{-1}$ , di mana, klorofita adalah dominan dengan purata menyeluruh  $70.54 \times 10^3$  sel  $\text{ml}^{-1}$  (34.30%), diikuti basillariofita dengan purata menyeluruh  $51.84 \times 10^3$  sel  $\text{ml}^{-1}$  (25.21%), sianofita  $48.92 \times 10^3$  sel  $\text{ml}^{-1}$  (23.79%), dinoflagellata  $22.68 \times 10^3$  sel  $\text{ml}^{-1}$  (11.03%), Krisofita  $9.48 \times 10^3$  sel  $\text{ml}^{-1}$  (4.61%) dan euglenoid  $2.19 \times 10^2$  sel  $\text{ml}^{-1}$  (1.06%). Komuniti zooplankton Empangan Semenyih terdiri dari tiga kumpulan iaitu kumpulan kopepoda, kladocera dan rotifer. Ketiga-tiga kumpulan zooplankton mempunyai purata menyeluruh  $5.7 \times 10^3$  organisma  $\text{l}^{-1}$ , dimana kumpulan dominan adalah kopepoda dengan nilai  $2.7 \times 10^3$  organisma  $\text{l}^{-1}$ . Kumpulan rotifer adalah kumpulan kedua terbesar dengan  $2.2 \times 10^3$  organisma  $\text{l}^{-1}$  dan diikuti kladoceran dengan hanya 716 organisma  $\text{l}^{-1}$ . Makrobentos Empangan Semenyih terdiri dari empat kumpulan iaitu moluska, gastropoda, annelida dan kironomida dengan purata menyeluruh 13,658.33 organisma/ $\text{m}^2$ . Kumpulan gastropoda terdiri dari dua spesis, iaitu *Melanoides tuberculada* dengan 3,170.20 organisma/ $\text{m}^2$  atau 23.21% dan *Filopaludina sumatrensis* dengan 2,844.32 atau 20.82%. *Thiara scabra* dengan 5,006.97 organisma/ $\text{m}^2$  atau 36.66% dan *Viviparus fasciatus* dengan 503.68 organisma/ $\text{m}^2$  atau 3.69% dari kumpulan moluska, dan kumpulan annelida dengan purata menyeluruh 533.29 atau 3.90% dan Kironomida terdiri dari 1,599.88 organisma/ $\text{m}^2$  atau 11.71%. Kajian di Empangan Semenyih juga meliputi aspek fiziko-kimia serta parameter biologi. Mutu air empangan adalah mantap dengan suhu air pada 28.53-29.01 °C, oksigen terlarut 6.16-7.01 mg  $\text{l}^{-1}$  dan bacaan kejernihan cakera secchi 50.0-100 cm. Sementara itu, parameter-parameter kimia seperti nitrat-nitrogen berada pada kepekatan purata 0.15-0.21 mg  $\text{l}^{-1}$ , fosfat-fosforus 1.19-2.03 mg  $\text{l}^{-1}$ , ammonia-nitrogen 0.26-0.30 mg  $\text{l}^{-1}$  dan silika 0.2-0.3 mg  $\text{l}^{-1}$ . Satu fakta tambahan berkenaan empangan yang bersandarkan kepada kualiti air,



komposisi air, makrobentos serta populasi ikan, Empangan Semenyih merupakan tasik mesotrofik.

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I certify that an Examination Committee met on 2<sup>nd</sup> December 2003 to conduct the final examination of Eduardo Dizon Peralta on his Master of Science thesis entitled "Food Availability and Stomach Content of Fish Populations in Semenyih Reservoir, Malaysia" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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## DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledge. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.



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EDUARDO D. PERALTA

Date: 05 MAR 2004

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## LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
JBA	Jabatan Bekalan Air Selangor
ca.	Approximately
°C	Temperature
NH <sub>4</sub> -N	Ammonia-nitrogen
PO <sub>4</sub> -P	Phosphorus-phosphate
NO <sub>3</sub> -N	Nitrate-nitrogen
L	Liter
µm	Micrometer
m	Meter
ml	Milliliter
cm <sup>2</sup>	Square centimeter
nm	Nannometer
mm	millimeter
cm	Centimeter
mg l <sup>-1</sup>	Milligram per liter
APHA	American Public Health Association
C&V	Cuvier and Valencienes
%	Percent
g	Gram
SE	Standard error
organisms l <sup>-1</sup>	Organism per liter
Cells ml <sup>-1</sup>	Cells per milliliter
organisms/m <sup>2</sup>	organisms per square meter



## CHAPTER I

### INTRODUCTION

Reservoirs and lakes are important in the development of a nation as they provide water supply for domestic, agricultural, industrial and other uses, electricity generation, fish supply, recreational opportunities and flood control. In Malaysia, with increasing number of dams and reservoirs being built, their role in providing fish supply as well as research fishery opportunities, to ensure sustainable fish production as well as maintenance of the original fish diversity in these water bodies (Yusoff and Ambak, 1999). The number of reservoirs in Malaysia has gradually increased due to the country's rapid industrialisation. There are 51 reservoirs in Malaysia, 46 of these are located in Peninsular Malaysia and the rest in East Malaysia (Ho, 1994).

The emergence of a reservoir, which are man-made lakes, has created impoundment's, which are productive-biological systems associated with their own fish and shellfish communities. Hence, reservoirs constitute potentially important resources for all types of fisheries including, fish culture, recreational and commercial fisheries (Oglesby, 1985). The beginning of reservoir fisheries is not certain. However, according to available information, reservoir fisheries in Southeast Asia are the oldest in the world (Seowardi and Mahar, 1987).

Studies on the feeding patterns of fish species help describe the ecological relationship of that species with the rest of the community (Caragitsou and Papaconstantinou, 1994). Consequently, knowledge of the feeding ecology of either commercial or non-commercial species is essential in implementing multi-species approaches to fishery management (Caddy 1988). Most studies on the food and